Current Research

Dietary Intake in the Lower Mississippi Delta Region: Results from the Foods of Our Delta Study

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ABSTRACT

Objective To collect and evaluate food intake data from a culturally diverse population and compare with national survey data.

Design The Foods Of Our Delta Study was a baseline, cross-sectional survey that utilized random-digit dialing methodology to identify the sample. Food intake was obtained from a 24-hour dietary recall administered by computer-assisted telephone interview using the multiple-pass method

Subjects/Setting One thousand seven hundred fifty-one adults and 485 children in the Lower Mississippi Delta (Delta) of Louisiana, Arkansas, and Mississippi.

Statistical Analyses Performed Comparisons of subsets within the Delta were made using weighted *t* tests. Comparisons of the Delta with the overall US population from the US Department of Agriculture Continuing Survey of Food Intakes by Individuals and with the Dietary Reference Intakes were made using independent sample *z* tests of weighted estimates.

Results Energy intake did not differ between the Delta and the US populations. Intakes of protein were lower, fat higher, and certain micronutrients lower in Delta adults than in US adults. Delta adults had a 20% lower intake of fruits and vegetables than the US adults and generally poorer adherence to recommendations of the Food Guide Pyramid. African American Delta adults generally consumed less-optimal diets than white Delta adults. Delta children had diets similar to children of the Continuing Survey of Food Intakes by Individuals sample population, but lower intakes were noted for vitamins A, C, riboflavin, and B-6, and for calcium and iron.

Applications/Conclusions Data such as these will help drive intervention development in this rural region and perhaps set the stage for research in similarly impoverished areas.

J Am Diet Assoc. 2004;104:199-207.

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0002-8223/04/10402-0006$30.00/0

doi: 10.1016/j.jada.2003.11.011

The National Nutrition Monitoring and Related Research Program (NNMRRP) of 1990 assessed the contributions of diet and nutrition status to health of Americans and factors affecting diet and nutrition status (1,2). It provides a database for nutrition intervention research (2-5). The national nutrition monitoring system of NNMRRP focused on representative sampling of the US population through surveys such as the National Nutrition and Health Examination Survey and the Continuing Survey of Food Intakes by Individuals (CSFII). While providing national data for comparative purposes, little attention has been directed to regional, state, or rural dietary surveys. Hence, particular regions have been underrepresented in national surveys. Sample numbers in the NNMRRP have been too small to adequately describe nutritional health of underrepresented regions or plan programs in these areas. Some regions have high concentrations of African Americans, Hispanics, and persons of poverty-level income, contributing to tremendous disparity in the prevalence of diet-related chronic diseases between regions. Surveys continue to demonstrate that African Americans have inadequate intakes from foods (6).

The Lower Mississippi Delta (Delta) represents one rural area not adequately evaluated for nutrition status and diet-related diseases (5). Traditionally agricultural, it borders the Mississippi River in Arkansas, Louisiana, and Mississippi, and is characterized by high poverty, low educational attainment, and high prevalence of diet-related chronic diseases (5,7). Because of well-documented needs and exceptional nutrition intervention research opportunities in this region, the Agricultural Research Service of the US Department of Agriculture (USDA) was directed by Congress in 1994 to study the effects of nutrition intervention on the health of this population (US Senate Report 103-290). The Lower Mississippi Delta Nutrition Intervention Research Initiative, a six-university consortium (two each in Arkansas, Louisiana, and Mississippi) and the Agricultural Research Service, was established to conduct sustainable community-based nutrition interventions.

The consortium determined that additional food intake data was needed before intervention planning. Consequently, the Foods Of Our Delta Survey 2000 (FOODS 2000) would provide baseline data describing nutrition and health status of the Delta population. Objectives of this study were to compare FOODS 2000 data to national data, (CSFII 1994-1996, 1998) (8) and evaluate food and nutrient intakes of Delta residents by selected demographic characteristics. The Dietary Reference Intakes (DRIs) (9-11) were used to assess adequacy of nutrient intake.

METHODOLOGY

FOODS 2000, a cross-sectional telephone survey using list-assisted random-digit dialing, included dietary intake in a representative population three years of age and older in 36 Delta counties. Children were categorized as being three to 18 years of age and adults were 19 years of age or older. The primary ethnic groups in the Delta are non-Hispanic whites (hereafter referred to as whites) and African Americans.

Sample

A two-stage stratified cluster-sampling plan was used. Estimates from the FOODS pilot study (12) and from CSFII (8) were used to calculate sample size using a two-sided test with 5% significance level and 80% power. Thus, 1,727 households were determined large enough to detect differences from national data estimates for a variety of outcomes; for example, difference of 0.5 serving of fruits and vegetables.

Data Collection Procedures

Westat, the Lower Mississippi Delta Nutrition Intervention Research Initiative Coordinating Center, Rockville, MD, conducted training and telephone interviews from January to June 2000. Techniques used to train telephone interviewers included home study, demonstration interviews, and interactive lectures and role-playing. Dietary intake for the previous 24 hours was obtained using the USDA multiple pass methodology (8). The 1994-1996 CSFII Food Instruction Booklet was modified slightly to include Delta foods commonly consumed. Interviews with children were conducted with the assistance of a parent or guardian for those younger than age 11 years. Additional information on foods eaten by children away from home was retrieved from school personnel and childcare providers. At first contact with the household, computer-assisted telephone interview determined household eligibility. Eligible households had at least one member 18 years of age or older and a nonbusiness only telephone number. During initial interviews, all household members were enumerated. Predetermined algorithms randomly selected one adult per household and sample child until designated sample size was obtained. Race/ethnicity and education level of each household member were collected. Household income data and participation in nutrition assistance programs were obtained during subsequent interviews.

A second, unscheduled telephone call collected information about food eaten during the previous 24 hours. Before this interview, food measurement guides and small monetary incentives were mailed to sample persons.

Dietary Data Processing

Westat forwarded 24-hour dietary recalls to the Pennington Biomedical Research Center dietary coding center for coding by trained coders using the Pennington Biomedical Research Center dietary coding database system and CSFII diet codes (8) to produce identical dietary and nutrient breakdowns as CSFII. After initial data entry, a second coder checked each recall to verify accuracy; 100% of recalls were rechecked by coding supervisors.

Statistical Analysis

Construction of sampling weights for FOODS 2000 was consistent with CSFII procedures (8). A household base weight equal to the inverse probability of selection was assigned to each sampled telephone number. Data were adjusted to compensate for telephone numbers with unknown residential or eligibility status, number of residential telephones in households, and screener nonresponse. To account for nonresponse to dietary interviews, weight of nonparticipants was distributed to participants within adjustment cells defined by age, race, and sex. Finally, estimates were calibrated to 1990 US Census Bureau estimates of total households by state. The Jackknife II method of calculating variances was used for FOODS 2000 as well as CSFII. Dietary recalls were analyzed for macronutrients, 10 vitamins, and seven minerals. Food serving intakes were calculated for selected major food groupings and subgroups from the Food Guide Pyramid servings database (13).

For comparisons with national intake data, only day one 24-hour recall intakes from CSFII were used, since FOODS 2000 collected only one 24-hour recall. For comparisons of domains within FOODS 2000 (eg, Delta African Americans vs Delta whites), weighted t tests (SUDAAN, version 8.0, 2001, Research Triangle Institute, Research Triangle Park, NC) were used. FOODS 2000 and CSFII were treated as independent samples. Resulting estimates were compared (eg, US African Americans vs Delta African Americans) using independent sample z tests (SAS, version 8.2, 2001, SAS Institute, Cary, NC). The P values were not adjusted for multiple comparisons.

Percentages of respondents meeting appropriate DRI were calculated for all reported nutrients using Institute of Medicine, Food and Nutrition Board guidelines (9,10). When available, the estimated average requirements (EARs) were used for comparison rather than the recommended dietary allowances in accordance with Institute of Medicine guidelines (6,11). Adequate intakes were used as cutpoints for calcium, acknowledging limitation of this approach.

Table 1. Comparison of demographic characteristics of Foods of Our Delta (FOODS 2000) and Continuing Survey of Food Intakes by Individuals (CSFII 1994-1996, 1998)

	FOODS 2000		CSFII 1994-1996, 1998	
Characteristic	**Sample size**	**Weighted percent ± SE[a]**	**Sample size**	**Weighted percent ± SE**
Adults	1,751	100.0±0.0	10,164	100.0±0.0
Race				
White	842	52.8±0.2	7,739	75.4±0.3
African American	857	43.8±0.5	1,150	11.3±0.1
Other	35	2.4±0.5	1,275	13.2±0.3
Unknown	17	0.9±0.2	NA	NA
Gender				
Male	655	46.6±0.3	5,198	48.0±0.1
Female	1,096	53.4±0.3	4,966	52.0±0.1
Income				
$0 to $14,999	497	24.3±1.2	2,249	15.3±0.3
$15,000 to $29,999	424	24.2±1.3	2,485	22.0±0.5
$30,000 plus	624	39.3±1.4	5,430	62.7±0.4
Unknown	206	12.2±0.9	NA	NA
Children	485	100±0.0	7,756	100.0±0.0
Race				
White	203	37.7±0.7	4,859	65.4±0.5
African American	265	58.8±1.0	1,162	15.8±0.3
Other	14	3.2±0.7	1,735	18.7±0.5
Unknown	3	0.4±0.2	NA	NA
Gender				
Male	231	50.4±0.8	3,940	51.2±0.4
Female	254	49.6±0.8	3,816	48.8±0.4
Income				
$0 to $14,999	106	24.6±2.1	1,515	16.9±0.5
$15,000 to $29,999	117	24.4±1.9	1,742	19.6±0.9
$30,000 plus	193	35.6±2.6	4,499	63.5±0.8
Unknown	69	15.5±1.7	NA	NA

[a]SE=standard error.

RESULTS

Table 1 presents demographics FOODS 2000 survey respondents compared with CSFII. Major differences between the two surveys were the smaller percentages of adult males and whites and the larger percentages of females and African Americans composing the FOODS 2000 sample population in the Delta, which is representative of the population.

Nutrient intakes of whites and African Americans in the Delta, compared with respective ethnic groups in the US population (CSFII), are shown in Table 2. Similarly, data on servings from USDA Food Guide Pyramid are presented in Table 3. Comparisons with the US population are described first.

Adult Intakes

There was no difference in reported energy intake in FOODS 2000 adult respondents compared to CSFII (Table 2). Protein consumption was lower in African Americans in the Delta compared to the US population and may be attributed to an overall lesser consumption of meat, legumes, and dairy, although individually none of these were significantly different from CSFII intakes (Table 3). Total carbohydrate consumption did not differ, but dietary fiber consumption was lower in both Delta groups (Table 2). One explanation may be significantly lower consumption of vegetables in both groups and in whites lower servings of fruit, grain, and cereal (Table 3). Total fat, all fatty acids, and cholesterol intakes were higher in Delta whites (Table 2), which may be explained by increased meat servings (Table 3).

Vitamin A, carotene, and vitamin C intakes were lower for both Delta groups than for their respective US population counterparts (Table 2). Thiamin intake was lower in Delta whites. Folate intake was higher in the Delta population and likely reflects folate fortification instituted in 1998, after most CSFII data were collected. Intakes of riboflavin, niacin, vitamin B-6, vitamin B-12, calcium, magnesium, iron, and potassium were lower in both Delta groups. Phosphorus, zinc, and copper consumption were lower in Delta African Americans.

When comparing food and nutrient intake within the Delta (Table 2), African Americans reported consuming less total energy and macronutrients than whites. Dietary fiber intake was lower for African Americans, perhaps somewhat attributable to lower vegetable intake. Vitamin C intake was higher in African Americans than whites likely due to higher fruit consumption (Table 3). Intakes of other vitamins and minerals were lower in

Table 2. Comparison of nutrient intakes in Delta Nutrition Intervention Research Initiative Foods of Our Delta 2000 and Continuing Survey of Food Intakes by Individual 1994-1996, 1998 by race

Adults Nutrient	Delta White (D-W) (n=842)	Delta African American (D-AA) (n=857)	US White (US-W) (n=7,739)	US African American (US-AA) (n=1,150)	*P* value D-W vs. US-W	 D-AA vs. US-AA	 D-W vs. D-AA
	←——— mean ± SE[a]			———→			
Energy (kcal)	2,089±34	1,926±32	2,058±17	2,000±44	NS[b]	NS	.0009
Protein (g)	78.5±1.6	71.4±1.0	78.3±0.6	77.6±1.5	NS	.0005	.0006
Carbohydrate (g)	251.7±4.2	233.4±5.2	256.9±2.0	242.1±5.8	NS	NS	.0094
Dietary fiber (g)	13.3±0.3	11.5±0.3	16.4±0.2	13.3±0.2	<.0001	<.0001	<.0001
Total fat (g)	82.0±1.6	76.3±1.5	76.7±0.7	78.7±2.1	.0025	NS	.0161
% Kilocalories from fat	35.1±0.3	34.5±0.4	32.8±0.2	34.2±0.4	<.0001	NS	NS
Saturated fat (g)	26.7±0.6	24.5±0.6	25.8±0.2	26.1±0.9	NS	NS	.0076
% Kilocalories from saturated fat	11.4±0.2	11.0±0.2	11.0±0.1	11.2±0.2	.0382	NS	NS
Monounsaturated fat (g)	31.6±0.7	30.2±0.6	29.4±0.3	30.8±0.7	.0031	NS	NS
Polyunsaturated fat (g)	17.4±0.4	15.8±0.4	15.5±0.2	15.6±0.4	<.0001	NS	.0042
Cholesterol (mg)	300±9	299±8	260±3	311±10	<.0001	NS	NS
Vitamin E (mg α-tocopherol equivalents)	8.8±0.3	7.6±0.3	8.6±0.1	7.5±0.2	NS	NS	.0104
Vitamin A (IU)	5,158±278	3,933±191	6,981±154	6,444±538	<.0001	<.0001	.0002
Carotene (RE)	377±27	268±17	528±14	453±26	<.0001	<.0001	.0002
Thiamin (mg)	1.5±0.04	1.4±0.03	1.6±0.02	1.5±0.04	.0367	NS	.0491
Riboflavin (mg)	1.8±0.04	1.5±0.03	2.0±0.02	1.7±0.06	.0007	.0223	<.0001
Niacin (mg)	21.7±0.5	19.7±0.4	23.5±0.2	21.7±0.4	.0007	.0004	.0051
Vitamin B6 (mg)	1.6±0.04	1.5±0.03	1.8±0.02	1.7±0.04	<.0001	<.0001	.0024
Folate (mcg)	328±7	292±7	267±3	229±7	<.0001	<.0001	.0011
Vitamin B-12 (mcg)	4.7±0.17	3.9±0.20	5.3±0.19	6.8±1.25	.0144	.0224	.0073
Vitamin C (mg)	72±3	90±4	97±2	106±5	<.0001	.0078	.0007
Calcium (mg)	735±20	554±15	797±8	612±21	.0037	.0243	<.0001
Phosphorus (mg)	1,248±26	1,023±17	1,265±9	1,106±29	NS	.0124	<.0001
Magnesium (mg)	266±6	205±4	285±2	230±5	.0020	.0001	<.0001
Iron (mg)	14.4±0.4	12.2±0.2	15.9±0.2	14.5±0.5	.0005	<.0001	<.0001
Zinc (mg)	11.7±0.4	9.6±0.3	11.5±0.1	11.0±0.4	NS	.0041	.0002
Copper (mg)	1.2±0.04	1.0±0.03	1.3±0.01	1.1±0.05	NS	.0056	<.0001
Potassium (mg)	2,659±49	2,085±44	2,797±21	2,408±51	.0097	<.0001	<.0001
Children	**(n=203)**	**(n=265)**	**(n=4,859)**	**(n=1,162)**			
Energy (kcal)	2,107±78	2,099±79	2,081±32	1,976±38	NS	NS	NS
Protein (gm)	71.8±4.1	71.3±2.2	71.0±1.2	69.4±1.6	NS	NS	NS
Carbohydrate (g)	279.1±9.8	270.6±10.0	287.3±4.3	257.7±4.2	NS	NS	NS
Dietary Fiber (g)	12.1±0.8	12.8±0.7	13.7±0.2	12.5±0.3	.0407	NS	NS
Total fat (g)	79.2±3.9	84.1±3.9	75.4±1.3	76.8±2.1	NS	NS	NS
% Kilocalories from fat	33.3±0.7	35.2±0.5	32.1±0.2	34.4±0.4	NS	NS	.0251
Saturated fat (g)	27.9±1.1	29.2±1.3	27.6±0.5	27.1±0.7	NS	NS	NS
% Kilocalories from saturated fat	12.0±0.3	12.3±0.2	11.8±0.1	12.2±0.2	NS	NS	NS
Monounsaturated fat (g)	31.2±1.7	33.1±1.6	29.1±0.5	30.0±0.9	NS	NS	NS
Polyunsaturated fat (g)	14.5±1.0	15.8±0.9	13.1±0.2	13.9±0.5	NS	NS	NS
Cholesterol (mg)	215±12	246±12	219±6	256±11	NS	NS	NS
Vitamin E (mg α-tocopherol equivalents)	8.3±0.9	8.2±0.7	7.3±0.1	6.9±0.2	NS	NS	NS
Vitamin A (IU)	3,383±323	3,943±317	5,294±163	4,206±191	<.0001	NS	NS
Carotene (RE)	185±31	256±31	327±15	262±197	<.0001	NS	NS
Thiamin (mg)	1.6±0.09	1.6±0.04	1.7±0.02	1.6±0.04	NS	NS	NS
Riboflavin (mg)	1.9±0.07	1.9±0.06	2.2±0.03	1.9±0.04	.0028	NS	NS
Niacin (mg)	19.4±1.0	20.0±0.6	21.0±0.4	20.0±0.4	NS	NS	NS
Vitamin B-6 (mg)	1.5±0.07	1.6±0.05	1.8±0.03	1.6±0.03	.0002	NS	NS
Folate (mcg)	312±15	325±12	278±5	253±5	.0305	<.0001	NS
Vitamin B-12 (mcg)	4.1±0.24	3.8±0.16	4.4±0.12	4.0±0.16	NS	NS	NS
Vitamin C (mg)	65±5	107±7	100±3	112±4	<.0001	NS	<.0001
Calcium (mg)	903±33	795±30	985±16	773±16	.0240	NS	.0302
Phosphorus (mg)	1,260±50	1,160±43	1,296±20	1,124±20	NS	NS	NS
Magnesium (mg)	232±12	220±8	250±3	219±4	NS	NS	NS
Iron (mg)	13.4±0.6	13.7±0.5	15.8±0.3	14.6±0.3	0.0003	NS	NS
Zinc (mg)	10.9±0.8	10.5±0.4	11.0±0.2	10.5±0.3	NS	NS	NS
Copper (mg)	1.0±0.06	1.0±0.04	1.1±0.02	1.0±0.02	NS	NS	NS
Potassium (mg)	2,268±113	2,309±81	2,471±39	2,239±44	NS	NS	NS

[a]SE=standard error.
[b]NS=not significant.

Table 3. Comparison of food serving[a] intakes Delta Nutrition Intervention Research Initiative Foods Of Our Delta Study 2000 and Continuing Survey of Food Intakes by Individuals 1994-1996, 1998 by race

Adults Serving type	Delta White (D-W) (n=842)	Delta African American (D-AA) (n=857)	US White (US-W) (n=7,739)	US African American (US-AA) (n=1,150)	*P* value D-W vs US-W	 D-AA vs US-AA	 D-W vs D-AA
	← *mean ± SE*[b] →						
Servings of fruits and vegetables	4.0±0.09	3.6±0.13	5.0±0.06	4.6±0.13	<.0001	<.0001	.0248
Servings of ready-to-eat cereal	0.3±0.03	0.3±0.03	0.4±0.01	0.3±0.03	<.0001	NS[c]	NS
Servings of total grain	6.0±0.14	5.7±0.16	6.9±0.07	5.9±0.16	<.0001	NS	NS
Servings of fruit	1.0±0.05	1.3±0.07	1.5±0.03	1.4±0.06	<.0001	NS	.0005
Servings of vegetable	3.0±0.08	2.3±0.10	3.5±0.04	3.2±0.14	<.0001	<.0001	<.0001
Servings of meat in oz	5.6±0.16	5.6±0.10	4.9±0.04	5.9±0.13	<.0001	NS	NS
Servings of meat and legume	5.8±0.16	5.8±0.11	5.1±0.04	6.1±0.12	<.0001	NS	NS
Servings of total dairy	1.3±0.06	0.8±0.04	1.5±0.02	0.9±0.05	.0025	.1021	<.0001
Servings of discretionary fat	63±1.4	57±1.4	59±0.6	59±1.8	.0049	NS	.0046
Servings of added sugar	25±0.7	23±0.8	20±0.3	22±0.9	<.0001	NS	NS
Children	**(n=203)**	**(n=265)**	**(n=4,859)**	**(n=1,162)**			
Servings of fruits and vegetables	3.3±0.21	4.2±0.21	4.2±0.08	4.1±0.11	<.0001	NS	.0024
Servings of ready-to-eat cereal	0.3±0.07	0.2±0.03	0.7±0.03	0.5±0.03	<.0001	<.0001	NS
Servings of total grain	6.9±0.30	6.7±0.31	7.3±0.11	6.6±0.14	NS	NS	NS
Servings of fruit	1.1±0.12	1.6±0.13	1.7±0.05	1.6±0.08	<.0001	NS	.0040
Servings of vegetable	2.2±0.15	2.7±0.17	2.6±0.07	2.6±0.11	.0353	NS	NS
Servings of meat	3.9±0.35	4.5±0.17	3.7±0.09	4.5±0.20	NS	NS	NS
Servings of meat and legume	4.1±0.39	4.7±0.18	3.8±0.09	4.6±0.21	NS	NS	NS
Servings of total dairy	2.0±0.11	1.6±0.08	2.2±0.05	1.6±0.06	.0469	NS	.0077
Servings of discretionary fat	63±2.9	66±3.3	60±1.1	60±1.6	NS	NS	NS
Servings of added sugar	30±1.4	26±1.2	26±0.6	23±0.7	.0194	NS	NS

[a]Servings of foods are by number, except for added sugars which is in teaspoons, and discretionary fat which is in grams.
[b]SE=standard error.
[c]NS=not significant.

African Americans compared with whites, possibly due to fewer servings of vegetables and dairy.

Of particular interest was the general inadequacy of nutrient intakes. These data are reported for adults in Figure 1. Intakes of fiber and calcium are of particular concern, with 20% or less of the adult population meeting the DRIs, and significantly fewer African Americans than whites meeting the DRIs. Fewer than 10% of the Delta population met EARs for vitamin E, and fewer than 40% for vitamin A, with African Americans consuming less vitamin A than whites.

Percentages of the adult Delta population meeting the DRIs are reported by income level in Figure 2. Significant differences existed for 15 nutrients. The percentages in the highest income group ($30,000+ total household income) meeting DRIs exceeded the lowest income group (<$15,000 total household income) by 7.3% to 15.8%, with the difference in percentage exceeding 10% for 13 of 15 nutrients. In Figures 1 and 2, note that adults in both ethnic groups regardless of income had very similar energy intake, with about 20% meeting the estimated energy requirement. Wide differences are seen, however, in percentages of these subgroups meeting requirements for some nutrients, suggesting differences in food selection patterns.

Child Intakes

Nutrient and food intakes of children in the Delta are also reported by race in Tables 2 and 3, and compared with each other and with their respective ethnic groups in the overall US child population. For African American children, the only nutrient difference between Delta and US population intakes was for higher folate in the Delta, and the only difference in Delta food intake was for fewer servings of ready-to-eat cereal; again this is probably not

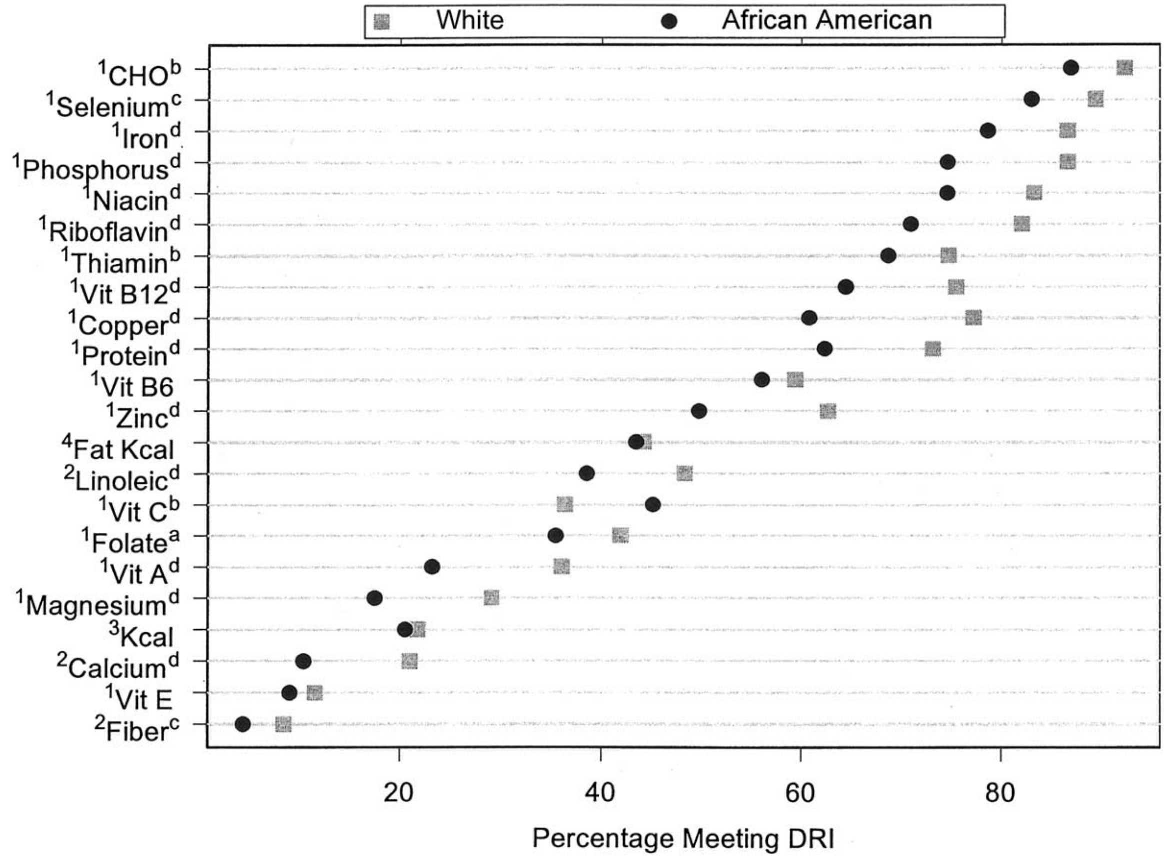

Figure 1. Percentage of Delta adults meeting the Dietary Reference Intakes (DRIs) according to ethnicity. 1=estimated average requirement; 2=adequate intake; 3=estimated energy requirement; 4=acceptable macronutrient distribution ranges; significance levels for comparisons by ethnicity: a=$P<.05$, b=$P<.01$, c=$P<.001$, d=$P<.0001$.

a real difference due to folate fortification. In contrast, white children in the Delta had significantly lower intakes of dietary fiber, vitamin A, carotene, riboflavin, vitamin B-6, vitamin C, calcium, and iron than respective US child populations. These nutrient intakes were consistent with lower intakes of ready-to-eat cereal, fruit, vegetables, and dairy foods (Table 3). Servings of added sugar were higher in Delta white children than in the United States.

When comparing food and nutrient intakes of children within the Delta, African American children had higher vitamin C intakes and more fruit servings than white children, whereas the reverse was true for calcium intake and servings of dairy products. African American children also consumed a higher percentage of energy from fat.

Figure 3 reports nutrient intake data compared to the DRIs. For eight of 15 vitamins and minerals, 80% or more of Delta children consumed the EAR. Twenty percent or fewer children consumed adequate fiber, and ≤40% of children consumed adequate calcium and vitamin E. In contrast with adult energy intake, lower percentages of African American children than white children meet the estimated energy requirement, possibly due to lower energy or total food intake.

DISCUSSION

This research describes dietary and food intakes of rural Delta residents, a region with historically high rates of poverty, poor education, limited access to health care, and high chronic disease burden. It compares intakes of Delta residents with intakes nationally, and also with recommendations for nutrient intakes.

When comparing Delta white adults with CSFII data, average servings of four food groups were lower, whereas intake of meat, discretionary fat, and added sugar was higher. Dietary fiber and some vitamin and mineral intakes were lower. Total fat and cholesterol intakes were higher. Delta African American adults more closely matched the national sample in food servings consumed, with the exception of lower vegetable servings in the Delta. In contrast, nutrient intakes were generally lower in Delta African Americans compared to the national sample. While no comparisons were made between the Delta and the national sample in meeting the DRIs, these data seem to characterize a population at risk for poor nutrition status.

Children in the Delta compared more favorably to children in national surveys. White children had lower intakes of fruit, vegetables, and dairy than children nationally, and consumed more added sugar. They had lower intakes of dietary fiber, and some vitamins and minerals. Average food and nutrient intakes of African American children in the Delta were very similar to children in the US population, with only vegetable servings being lower. Average intakes of folate were consistently higher in all Delta groups, which is primarily due to food fortification,

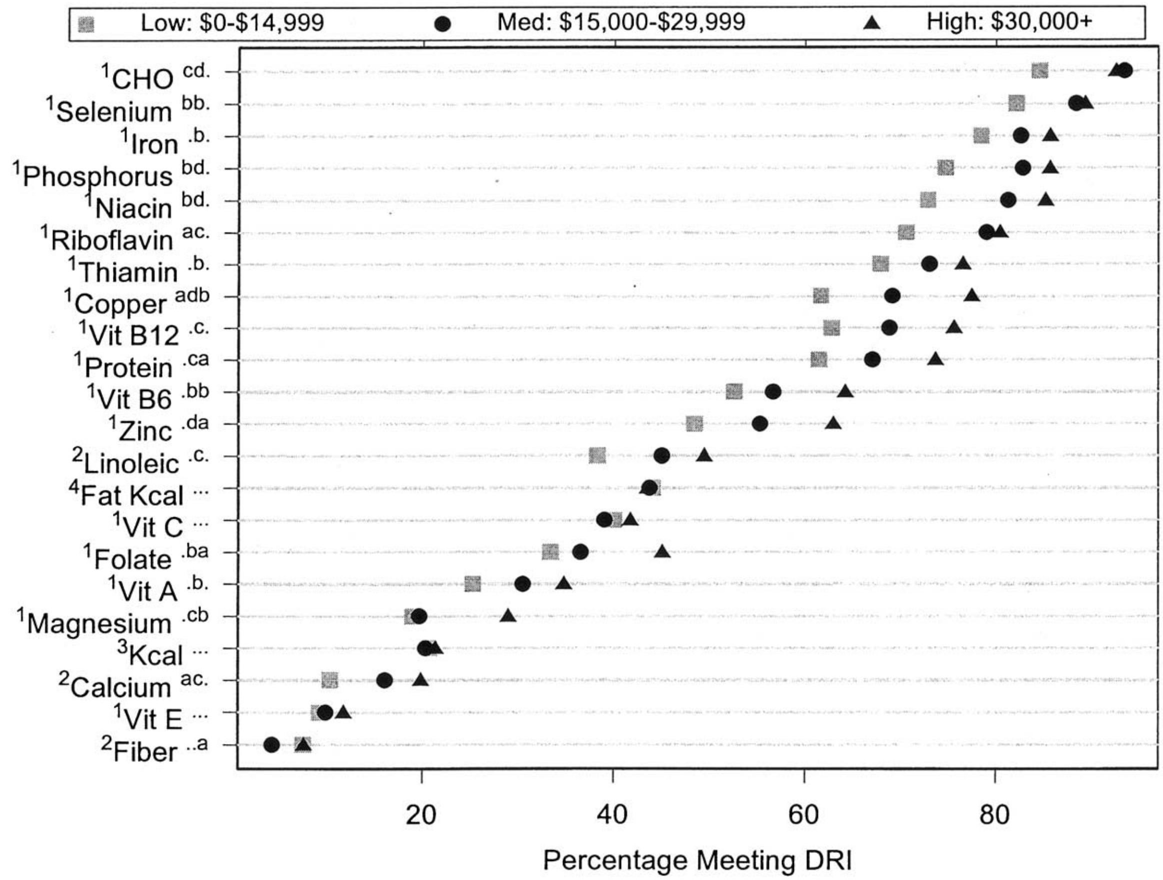

Figure 2. Percentage of Delta adults meeting the Dietary Reference Intakes (DRIs) based on household income. 1=estimated average requirement; 2=adequate intake; 3=estimated energy requirement; 4=acceptable macronutrient distribution ranges; significance levels for comparisons by income (low-vs-med, low-vs-high, med-vs-high): a=$P<.05$, b=$P<.01$, c=$P<.001$, d=$P<.0001$.

which occurred between the time of the national survey and our FOODS 2000 study. When comparing Delta children's nutrient intakes with the DRI, 50% or more children met the DRI for all nutrients except fiber, vitamin E, and calcium.

Generally, Delta African American adult food and nutrient intakes were poorer than whites'. With a few exceptions, nutrient intakes of children did not differ by race. Poor nutrient intakes were also associated with low income.

These comparisons highlight inadequate food and nutrient intake of Delta residents, appearing more pronounced in African Americans than whites, in adults than in children, and in lower income households. This raises concern because of the chronic disease burden in this population. The Delta has some of the highest prevalence rates nationally for diet-related chronic diseases such as heart disease, hypertension, and obesity (7). Poor intakes of fruits, vegetables, and dairy products may warrant particular emphasis in future regional nutrition interventions. While lack of fruits and vegetables can result in inadequate vitamin and mineral intake, it may also be related to high rates of heart disease and hypertension in the Delta population (14). In a study by Keyserling et al (15), residents of the rural South reported high intakes of high fat meats, snack foods, and sweets, which may be related to high incidence of subjects (60%) with two or more coronary disease risk factors. Our data indicate that adult Delta whites, but not African Americans, consumed more servings of discretionary fat, added sugar, and meat and less dairy and grain than the CSFII population. While quality of vegetable servings is not addressed in this article, preliminary data suggest that consumption of french fries and potato chips may account for much of the total vegetable consumption (16). Other researchers have reported poor eating patterns in rural children (17) and success in increasing fruit and vegetable consumption in African American populations through nutrition intervention (18-20).

The relatively better quality of children's diets in the Delta may suggest that nutrition assistance programs targeted at children might have positive effects on diet quality. Evaluation of national programs such as school lunch and school breakfast show favorable effects on children's diets (21). Participation rates in these programs are high in the Delta (5).

These data identify problems in dietary intake in the Delta, but limitations suggest prudence in interpretation. Inherent limitations in dietary data collection through self-report include underreporting of food intake (10). Underreporting could tend to exaggerate inadequacies in intake, although this is not likely problematic when making comparisons with CSFII, because the same data collection methodology was used. In this study, DRI compar-

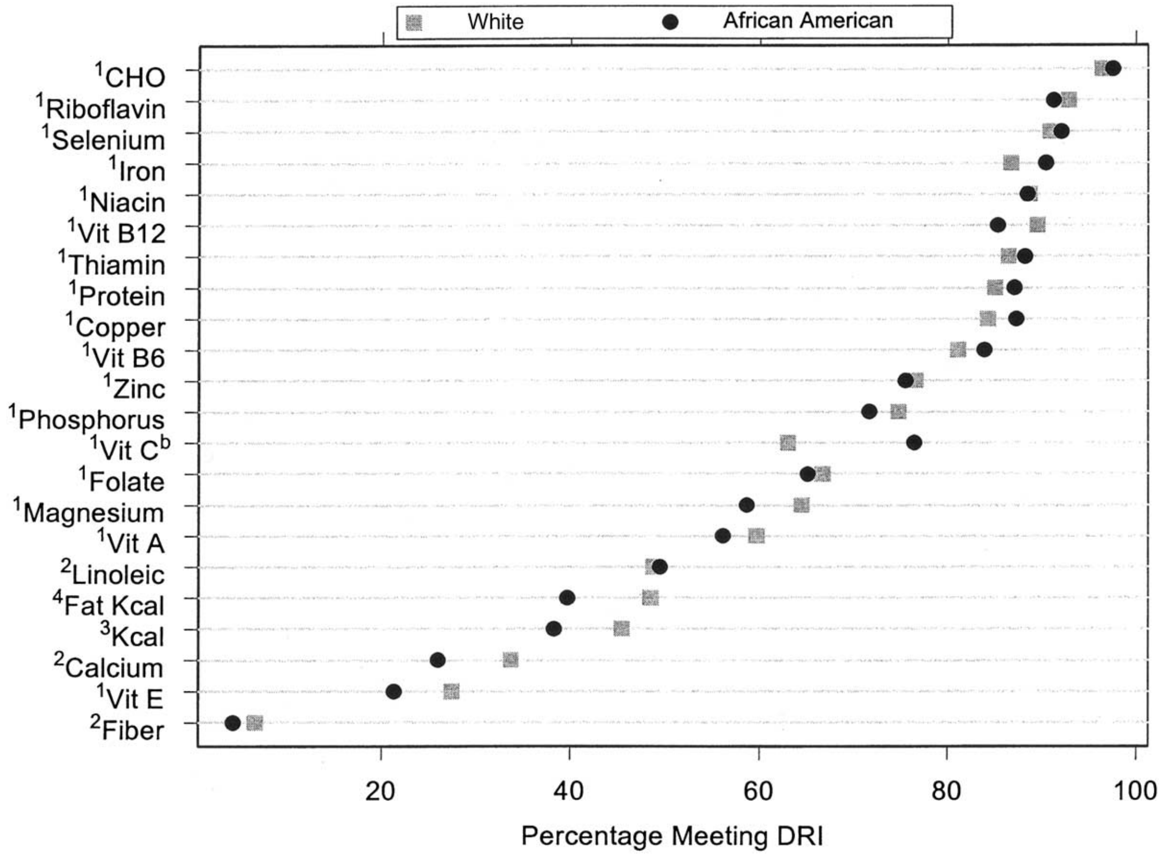

Figure 3. Percentage of Delta children meeting the Dietary Reference Intakes (DRIs) according to ethnicity. 1=estimated average requirement; 2=adequate intake; 3=estimated energy requirement; 4=acceptable macronutrient distribution ranges; significance levels for comparisons by ethnicity: a=$P<.05$, b=$P<.01$, c=$P<.001$, d=$P<.0001$.

isons were made on the basis of a single 24-hour recall, another limitation (10); multiple recalls are necessary for assessing individual intake adequately. For nutrients with no established EAR, the adequate intake value was used for comparison purposes, which would tend to overestimate the level of inadequacy.

CONCLUSIONS

This study provides evidence for population differences in food and nutrient intake in comparisons within the Delta and with national data. Thus, development of sustainable community nutrition interventions, like increasing fruit and vegetable intakes, should enable this population to better meet the new DRIs. Once interventions are in place, additional surveys will monitor change in diet and eating patterns. The importance of determining and evaluating dietary intake of at-risk populations in the United States, like those in the Delta, is evident. Comparisons of regional data with national data and with dietary intake recommendations are necessary in evaluating diet quality, best practices, and targeted intervention outcomes in diverse populations.

The authors thank Donna Ryan, MD, Patrick Casey, MD, and Edith Neal Hyman, PhD, (principal investigators along with authors Champagne, Bogle, Yadrick, and McGee) for their substantial contributions to the conduct of the study and their critical evaluations of the data presented in this article.

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